LYNCHBURG CITY COUNCIL
Agenda Item Summary

MEETING DATE: **March 23, 2004 Work Session** AGENDA ITEM NO.: 5

CONSENT: REGULAR: **X** CLOSED SESSION: (Confidential)

ACTION: **X** INFORMATION:

ITEM TITLE: **James River Tributary Strategy**

RECOMMENDATION: Adopt the attached resolution requesting the Commonwealth to defer adoption of the draft 2004 James River Tributary Strategy.

SUMMARY: The State of Virginia in cooperation with the Chesapeake Bay Program is in the process of finalizing revised Tributary Strategies for the river basins that discharge directly into the Chesapeake Bay for the purpose of reducing pollution to the Bay, specifically pollution from the excessive nutrients nitrogen and phosphorus. These nutrients, while necessary for the growth of plants, in excess have a detrimental impact to aquatic life in the Bay and its rivers. Similarly, sediment also impacts water quality and the ecosystem.

These draft Tributary Strategies could lead to potential permit limits for nitrogen and phosphorus for the Lynchburg Regional Wastewater Treatment Plant. The discharge limits that are being considered are 8 milligrams per liter (mg/l) for nitrogen and 1 mg/l for phosphorus. In order to meet limits such as these year round, significant capital improvements would be necessary for the Wastewater Treatment Plant. Scientific evidence and the current year 2000 Tributary Strategy indicate that these limits are unfounded due to the location in which the James River discharges to the Chesapeake Bay and more specifically the location of the Wastewater Treatment Plant on the James River. Studies further indicate that efforts should focus more on water quality issues in the River itself. Of these, sediment, not nutrients, appears to be the primary concern for areas above the fall line. Further, various actions have already reduced the total pounds of nitrogen that have been allocated to the James River below the 2000 Tributary Strategy goals.

The official draft 2004 James River Tributary Strategy was originally due out the first of March. However, the computer model has indicated that the limits that are currently being proposed do not remove adequate quantities of nutrients. Therefore, additional reductions are being explored and could further impact Lynchburg.

PRIOR ACTION(S): None

FISCAL IMPACT: Potentially $60 million upgrade to the Regional Wastewater Treatment Plant, and in excess of $750,000 per year in additional operating expenses in today's dollars. These costs are expected to continue to increase 3-4% per year with a possible implementation goal of 2010.

CONTACT(S): Timothy A. Mitchell, P.E., Assistant Director of Utilities, 455-4252
Dan Sneed, Director of Utilities, 455-4257
Bruce McNabb, P. E., Director of Public Works, 455-3946

ATTACHMENT(S): Resolution
James River Tributary Strategy Background
Greeley and Hansen Memorandum
Map of the Chesapeake Bay Watershed
Map of the James River Basin

REVIEWED BY: lkp

Resolution

WHEREAS, the James River system is a precious natural resource of immeasurable value to the citizens of City of Lynchburg and 3.5 million Virginians in the James River basin; and

WHEREAS, the City has demonstrated, through its actions and investments, its strong commitment to protecting and improving the water quality of the James River; and

WHEREAS, among other significant undertakings, the City is continuing to effectively implement substantial capital projects pursuant to an approved Long Term Control Plan for the combined sanitary and storm water collection system, which, like more than 1,000 similar systems nationwide, was designed and constructed to overflow when water volumes exceed system capacity during wet weather; and

WHEREAS, in cooperation with the Commonwealth of Virginia, the City has substantially increased sewer rates charged to its ratepayers to implement this unprecedented collection system rehabilitation program and meet other water quality goals of the community; and

WHEREAS, an extensive scientific effort during the 1990s led to the issuance of the year 2000 James River Tributary Strategy for reducing the amount of sediment, nitrogen, and phosphorus entering the James River, and suspended sediment is the most significant water quality problem in the James River; and

WHEREAS, while the Commonwealth is far from completing implementation of the existing 2000 Tributary Strategy, the Lynchburg Regional Wastewater Treatment Plant is in full compliance with that Strategy and, further, the Strategy establishes no additional obligations relative to the Regional Plant; and

WHEREAS, pursuant to the Chesapeake Bay Program, the Secretary of Natural Resources is revising the 2000 Tributary Strategy to meet new, more stringent nitrogen and phosphorus Bay goals; and

WHEREAS, the Virginia Department of the Environmental Quality has determined that nitrogen and phosphorus levels in the James River, which meets the Bay near its mouth to the Atlantic Ocean, are not contributing to the impairment of the Chesapeake Bay; and

WHEREAS, due to the James River being the only Virginia river assigned responsibility for removing “orphan pounds” of nitrogen that upstream States did not agree to reduce as well as a significant error of a mathematical nature, the draft 2004 Tributary Strategy is substantially more stringent than the current Tributary Strategy, without a sound scientific basis; and

WHEREAS, should the draft 2004 Tributary Strategy be adopted in its current form, it would dictate substantial capital expenditures for modification of the Lynchburg Regional Wastewater Treatment Plant that are not scientifically justified and have not been shown to provide any meaningful public benefit or environmental enhancement.

NOW THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF LYNCHBURG:

That the Council hereby requests that the Commonwealth defer adoption of the draft 2004 Tributary Strategy and any additional nitrogen and phosphorus related requirements applicable to the Lynchburg Regional Wastewater Treatment Plant unless and until warranted by future scientific studies, and that water quality management decisions for the James River should focus on improving water quality in the River itself; and

BE IT FURTHER RESOLVED That the City urges the Secretary of Natural Resources and the Department of Environmental Quality to conduct appropriate scientific studies of the James River as soon as possible in consultation with appropriate City and County officials.

Adopted:

Certified: _____
Clerk of Council

041L

James River Tributary Strategy Background

I. Chesapeake Bay Program

The Chesapeake Bay is North America's largest and most diverse estuary, and is the home of more than 3,600 species of plants, fish, and animals. Studies performed over 20 years ago determined that the Bay was being significantly impacted by toxic pollutants, over harvesting, sediment, and most importantly, excessive nutrients. As a result, in 1983, the states of Virginia, Maryland, and Pennsylvania, the District of Columbia, the Chesapeake Bay Commission, and the U.S. Environmental Protection Agency (EPA) signed historic agreements that established the Chesapeake Bay Program partnership to protect and restore the Chesapeake Bay's ecosystem.

The original Agreement and the subsequent 1987 Agreement also established the Chesapeake Executive Council and Implementation Committee. The Executive Council consists of the Governors of Maryland, Pennsylvania, and Virginia, the Administrator of the U.S. Environmental Protection Agency, the Mayor of the District of Columbia and the Chair of the Chesapeake Bay Commission, a legislative body serving Maryland, Pennsylvania, and Virginia. The Principals' Staff Committee (PSC) acts as the policy advisors to the Executive Council, accepting items for Council consideration and approval, and setting agendas for Council meetings. Individual members of the PSC arrange and provide briefings to their principals, the Agreement signatories. The PSC consists primarily of members of the Governors' cabinets, the heads of the States' Department of Environmental Quality, and other representatives from EPA, the District of Columbia, and the Chesapeake Bay Commission. W. Tayloe Murphy, Jr., Virginia's Secretary of Natural Resources, is the current Chair of the PSC.

Another group working with the Executive Council is the Chesapeake Bay Water Quality Steering Committee (WQSC). The WQSC is composed of representatives from all six Bay watershed states - Delaware, Maryland, New York, Pennsylvania, Virginia, and West Virginia, plus the District of Columbia, EPA Region III, EPA Region II, the Chesapeake Bay Commission, the Susquehanna River Basin Commission, and the Interstate Commission on the Potomac River Basin. The EPA Region III Water Division Director chairs the Steering Committee. The purpose of the Water Quality Steering Committee is to provide the management oversight for the process of integrating the cooperative and statutory programs of the Chesapeake Bay and its tributaries.

II. Nutrients

Nutrients such as nitrogen and phosphorus occur naturally in water, soil, and air. Both are essential to the growth of plants within the Bay and rivers that discharge into it. Although essential, an excess of these nutrients is harmful. Excess nutrients cause the rapid growth of phytoplankton, creating dense blooms. These blooms reduce the amount of sunlight available to Submerged Aquatic Vegetation, (SAV). Without light these plants cannot survive. As they die and decompose they deplete the bottom waters of oxygen, which is necessary for the survival of fish and other species.

The primary source of the excessive nitrogen in the Bay is from non-point sources, such as farmland. Point sources, such as wastewater treatment plants contribute approximately 20% of the excessive nutrients in the Bay yet, at this time, they are the primary target for nutrient reduction.

III. Sediment

Sediment is loose particles of clay, silt, sand, and other substances that are suspended in the water and ultimately settle to the bottom of a water body. Sediments are a result of erosion during rainfall and snow melts and come from farmland, new development, and urban areas. Sediments can smother bottom dwelling plants and animals such as oysters and clams. Additionally, suspended sediments cloud the water and inhibit light for the essential underwater Bay grasses. Sediments can also carry concentrations of toxics which can increase nitrogen pollution. Sediment has been identified as the number one issue of the James River.

IV. Chesapeake Bay Program's 2000 Tributary Strategy

The Chesapeake Bay Program's (CBP) 2000 Tributary Strategy reaffirmed the partnership and goals for the Chesapeake Bay. Tributary strategies are detailed descriptions of planned local actions, riparian forest buffer replanting, waste water treatment upgrades, nutrient management on farms, storm water treatment, stream restoration, and a schedule for undertaking those actions necessary to reduce nutrients and sediment loads from each tributary watershed to reach the assigned loading caps by 2010. Development of tributary strategies has been a public process and includes involvement by local governments, watershed associations, regional organizations, and a variety of other interested local stakeholders.

The goal for the James River called for a 32 percent reduction in nitrogen to 28.1 million pounds per year (Mlb/yr) based on a "1985 Baseline Condition" of 41.2 Mlb/yr. In March 2003, the Chesapeake Bay Program's Water Quality Steering Committee (WQSC) agreed that the 2000 James River Tributary Strategy nitrogen goal was appropriate for the James River due to the negligible influence of the James River on the mainstem Bay. Further, the WQSC identified 175 Mlb/yr as the Baywide nitrogen loading goal to be divided among the various basins and jurisdictions. Based on analysis the WQSC established a new nitrogen allocation goal of 27.9 Mlb/yr for the James River Basin, slightly less but apparently similar to the 2000 strategy. (A comparison of loadings is shown on the table on the next page.)

On March 21, 2003, the CBP's Principal's Staff Committee (PSC) met to consider the WQSC's load recommendations. One outcome of the meeting was to further reduce the James River nitrogen load allocation by an additional 1.5 Mlb/yr to account for "orphan" load reductions (load reductions not accounted for by other States or basins) needed to bring the Baywide nitrogen load down to 175 Mlb/yr. The resulting load allocation of 26.4 Mlb/yr was officially announced by the CBP in April 2003.

However, the total discrepancy between the 2000 goals and the PSC's load allocations is actually much greater as a result of the new load allocations being applied to a larger definition of the James River Basin which now includes "Western Shore James" basins which were previously accounted for in the York River Basin. These additional loads that need to be accounted for are estimated to be as much as 6 Mlb/yr. This is identified as the significant math error in the attached Resolution.

James River Load Allocation Changes

2000 Strategy Goal	WQSC Recommendation, March 2003	PSC Allocation of Orphan Loads, April 2003	James River Basin Definition Impact, April 2003
28.1 Mlb/yr	27.9 Mlb/yr	26.4 Mlb/yr	*20.4 Mlb/yr

**The 20.4 Mlb/yr is an estimate of the additional impacts as a result of the additional loadings from the "Western Shore James" area. The published goal is still 26.4 Mlb/yr. This discrepancy has been brought to the attention of the PSC but has yet to be acknowledged.*

In order to meet the new nitrogen load allocations, the wastewater treatment plants discharging to the James River could be subject to strict nitrogen effluent limits. Currently, the Lynchburg Regional Wastewater Treatment Plant does not have a nitrogen limit but is in compliance with the 2000 Tributary Strategy. Based on the 2000 James River Tributary Strategy, other scientific evidence, and the fact that the James discharges at the mouth of the Bay, it is well documented that the James River has little impact on the mainstem Bay. This fact has been acknowledged by the Department of Environmental Quality and the CBP. Further, scientific evidence also indicates that nitrogen from discharging above the fall line (Richmond) of the James has little impact on the tidal fresh portion of the James.

The draft 2004 Tributary Strategy for the James River indicates a nitrogen discharge limit of 8 milligrams per liter (mg/l) and a phosphorous limit of 1 mg/l for Lynchburg's plant. The consequences of this could be significant. Currently, the Lynchburg wastewater plant's nitrogen discharges average 9 mg/l, only slightly more than the proposed limit of 8mg/l. However, in order to meet a year round effluent requirement of 8 mg/l, major capital improvements may be necessary. In a March 12, 1998 Memorandum from Greeley and Hansen, it was estimated that construction costs for Biological Nitrogen Removal (BNR) would be approximately $54 million with annual operating expenses in excess of $600,000 per year. In today's dollars, this equates to over $60 million for construction and over $750,000 in annual operating expenses. BNR is necessary to achieve an 8 mg/l nitrogen discharge. While a portion of this cost may be funded through the State's Water Quality Improvement Fund, a capital project of this magnitude would have a major impact on the City's Sewer Fund, and would result in **much higher sewer rates than we are already experiencing**. The City's Combined Sewer Overflow (CSO) Program, which is much more beneficial to the overall environment, could also be significantly impacted. The goal of the draft 2004 Strategy is to meet these nutrient reductions by 2010; this too is unrealistic. Most of those involved in following the Strategies agree that 2015 would be the earliest that goals of this magnitude could be achieved.

It is important to note that the official draft 2004 James River Tributary Strategy was originally due out the first of March, 2004. However, computer models have indicated that the discharge limits that are currently being proposed do not remove adequate quantities of nutrients Therefore, additional reductions are being explored and could further impact Lynchburg. The new target for the official draft Strategies to be released is April 1st with a 30 day comment period. This is clearly insufficient time to consider a subject with this much potential impact. The strategies are expected to be adopted soon by the Secretary of Natural Resources after the comment period has ended.

While protecting the Bay and its tributaries is important, decisions should be made based on scientific evidence instead of political reasons. Resources, including money, should be spent where the most beneficial impacts are achieved.

The Service Authorities for Amherst, Bedford, and Campbell Counties are also expected to approach their respective Boards with similar resolutions in opposition to the draft 2004 James River Tributary Strategies.

GREELEY AND HANSEN

WASHINGTON OFFICE

MEMORANDUM

DATE: March 12, 1998

TO: James River Tributary Strategy File

FROM: Mark Kennedy

SUBJECT: Costs to upgrade the Lynchburg WWTP to achieve Biological Nutrient Removal and Limit of Technology Nitrogen Removal

A tributary strategy is being developed for the James River as part of the development and implementation of nutrient reduction strategies for Virginia's tributaries to the Chesapeake Bay. To assess the cost effectiveness of various nutrient reduction options, major WWTPs have been asked to develop cost estimates for plant upgrades to achieve Biological Nutrient Removal (BNR) and Limit of Technology (LOT) nitrogen removal efficiencies. It has been estimated that BNR plants will achieve a total nitrogen concentration of 8 mg/L on an annual basis and that LOT can achieve 3 mg/L on an annual basis. This memorandum outlines the costs of both BNR and LOT upgrades to the Lynchburg WWTP. A summary of current and recent upgrade activities is also included.

1. Current and Recent Upgrade Activity

The Lynchburg WWTP is currently in Phase IV of its ongoing upgrade program. The latest upgrades will enable the plant to more efficiently handle increased industrial and residential loads through the use of fine bubble diffused aeration and improved sludge stabilization processes. A summary of the recent upgrades (since 1991) and their costs is as follows:

Phase I	Dechlorination and Solids Thickening Improvements (1991)	$ 2.885M
Phase II	Central Building Upgrade (included laboratory, administrative, electrical distribution and operations control areas) (1994)	$ 1.728M
Phase III	Headworks Additions (included new influent pump station, screening and grit removal facilities) (1997)	$ 6.609M
Phase IV	Secondary Treatment and Sludge Stabilization Upgrades (includes fine bubble diffused aeration and centrifugal/lime stabilization) (Current)	$ 15.55M
	Total Upgrade Costs	$26.772M

The Phase IV upgrade is currently underway. Even though the aeration and solids process improvements are not yet complete, interim improvements to the solids handling facilities have significantly reduced effluent nitrogen by eliminating high strength recycle flows. It is estimated that an average total N of 8 mg/L has been achieved already, without a BNR upgrade. Some variability in treatment efficiency is expected during the upgrade, but stabilized operations upon completion of the Phase IV upgrade may meet an annual average total N of 8 mg/L even without BNR.

2. Combined Sewer Overflow (CSO) Elimination Program

Since 1989, the City of Lynchburg has undertaken a massive sewer separation program to eliminate CSO into the James River. Thus far, over $68 million has been spent to replace/enlarge sewers, close overflow points and reduce inflow and infiltration. Stormwater retention basins have also been constructed to control the flow of the increased stormwater volume caused by the separation of the sanitary sewers. Those retention basins are a combination of flow-through and holding ponds with a total effective drainage area of 530 acres.

This combination of CSO and stormwater control represents a major effort by the City to protect health and reduce sediment and pollution loads to the James River. This program is vital to improve water quality in this region. An estimated additional $202M in construction is needed to complete the CSO elimination program for Lynchburg. Mandates to divert funds to other, less critical environmental projects, will slow the CSO project and increase its total cost due to inflation.

3. BNR Upgrade Options

Upgrading the Lynchburg WWTP to BNR would cost about $54M. The increase to annual operations and maintenance would be about $0.62M. These estimates are based on similar WWTP upgrades in Virginia and a typical treatment process design. Variations in detailed design are expected so that these cost estimates may vary from -20% to +35% of actual costs. However, they are considered accurate for comparison purposes.

Under this scenario, the BNR upgrade would include a new nitrification basin, increased aeration capacity and two (2) new clarifiers. It is believed at this time that the current sludge stabilization upgrades (in progress) would be able to handle the additional sludge volume generated by a BNR process. A breakdown of the unit costs and their rational is as follows:

1.	New BNR Aeration Basin	$10.2M	Equivalent Annual Cost
2.	2 Clarifiers	$ 3.3M	(20yrs, 8%)
3.	Excavations for 1 & 2	$ 4.6M	Capital = $5.51M
4.	Excavation for Hill removal	$ 36M	O&M = $0.62M
		$54.1M	
	Operations and Maintenance (annual)	$0.62M	**Annual Total = $6.13M**

The WWTP is located on a site surrounded by large hills (e.g. 140 feet above grade next to the existing aeration basin) and the James River. Therefore, excavation costs are high for this site because of the large amount of material to be moved. Further, the costs presented here are based on an accelerated schedule which will require drilling and blasting, shock monitoring, and projectile control.

It is possible to reduce the excavation costs by greatly extending the construction schedule and using the excavated material for cover in the adjoining landfill. Faster excavation would be more expensive. Scraping techniques can be used because the hill is comprised primarily of erodible micaceous schists. However, an extended schedule would result in pushing the upgrade completion date well into the next decade.

4. LOT Upgrade Options

The LOT upgrade to reduce total nitrogen to 3 mg/L includes a reconfiguration of the BNR aeration system layout and methanol addition facilities. The total estimated capital cost is $22M only one million dollars more than the BNR option. However the increased operations and maintenance for this system is estimated at $1.62M annually. The incremental cost for LOT is much lower than the cost for BNR because the excavations and new facilities will be substantially completed under a BNR upgrade. The cost breakdown is as follows:

1.	BNR Plant Upgrade	$ 54.1M	Equivalent Annual Cost
2.	Methanol facilities	$0.445M	(20yrs, 8%)
3.	Site Prep for 2	$0.400M	Capital = $5.60M
	total (approx)	$ 54.9M	O&M = $1.62M
	Annual Op & Maint. (includes $0.9M for methanol)	$ 1.62M	**Annual Total = $7.22M**

5. Economic Evaluation

Based on the BNR and LOT upgrade costs developed above, the following annual nitrogen reduction costs can be calculated.

Upgraded System	Nitrogen Reduction (see note 1)	Annual Load
BNR Option	$12^{(1)}$-8 = 4 mg/L	0.268 million lbs
LOT Option	$12^{(1)}$-3 = 9 mg/L	0.603 million lbs

Cost per pound of nitrogen:

For BNR: $6.13M / 0.268M lbs = $22.87/lb

For LOT: $7.22M / 0.603M lbs = $11.97/lb

Due to the high costs of either of these alternatives, it is unlikely that they could be considered cost effective strategies for inclusion in the James River Tributary Strategy document.

Note: (1) 12mg/L is chosen for a baseline annual average N concentration based on a maximum error in the current effluent N estimate of 50% (i.e. 8 mg/L + 0.5 (8 mg/L) = 12 mg/L).